

July 2004 Report of the Tevatron BPM Upgrade  
wbs item 1.4.5.4  
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August 12, 2004

**Project Manager's Summary:**

The Tevatron BPM Upgrade project made steady progress in July on all fronts. The biggest step forward was the successful integration of the new hardware and software on the teststand in the Feynman Computing Center. This integration required a large number of components be working properly and that many people from many parts of the project provide subsystems and worked out the integration of those systems. The next step is to build a system and install it in the Tevatron, read out beam positions in A3, record the information in the controls system, and verify that it makes sense. The goal is to have such a system in place and reading out well-understood information before the shutdown.

Progress was made on all of the hardware components of the system during this month. The first Echotek boards were thoroughly tested – two of them were usable, the third was returned to Echotek. Measurements were made on return loss, impedance, and the standard prep tests were run. Some channel-to-channel gain variations were seen. Some anomalous behavior (compared to the Recycler boards) was seen in the prep tests. Issues with DMA chaining were also brought to Echotek's attention. Echotek has laid out and is producing a new version of the board and this board should be in Echotek's hands at the end of July. After their tests we expect to see a board the second week of August. Daily contact with Echotek is being maintained as we work to validate the board and proceed to the full 150 board production. The schedule is tight.

The filter board and the timing board prototypes were built and tested in July. Both boards performed well and work is proceeding along the lines of producing the full complement of production boards, once all of the functionality and other tests are finished.

A major accomplishment in July was placing the order for the 1200 analog band-pass filters required for the front-end of the system. This required a fair amount of discussion with vendors regarding requirements and specifications, acquisition of prototype filters, testing of those filters, and meeting with representatives of a vendor. The work was successful and the order has been placed.

The front end and online software both advanced nicely and were instrumental in the big integration success mentioned above. Work continues to develop the production software. This includes the diagnostics programs, where some progress has been made to integrate the Tevatron BPM system into the R25 console application.

A new effort to understand the details of the Graychip and other digital filter and processing issues on the Echotek board is moving forward. New effort from Eric James

and Gustavo Cancelo has been added to move this task along. This understanding will be critical in the final configuration of the system.

**Resources Used in July 2004:**

The total number of FTE-months devoted to the project in calendar July 2004 from the Computing Division was reported to be 8.1 FTE-months with 20 people contributing. The total number of FTE-months devoted to the project from the Accelerator Division was 2.0 FTE-months with 8 people contributing. The total effort from both Divisions was 10.1 FTE-months. The following table gives the estimated or reported effort for both divisions (in FTE-months) since August of 2003.

Month	AD Effort	CD Effort	Total Effort
August, 2003	1.2	2.3	3.5
September, 2003	1.4	4.1	5.5
October, 2003	5.4	6.0	11.4
November, 2003	1.6	5.0	6.6
December, 2003	1.4	4.4	5.8
January, 2004	1.7	5.1	6.8
February, 2004	2.3	6.7	9.0
March, 2004	2.1	7.6	9.7
April, 2004	2.0	7.7	9.4
May, 2004	1.4	8.3	9.7
June, 2004	1.6	8.7	10.3
July, 2004	2.0	8.1	10.1
SUM	24.1	74.0	98.1

The effort is consistent with the wbs estimates of approximately 10-12 FTE per month during this period. The effort listed here is actual productive time worked and does not include vacation, sick leave, holidays, etc.

**Purchase requisitions/procard orders placed in July, 2004:**

<b>PO</b>	<b>Date</b>	<b>Item</b>	<b>Est Cost</b>
PO557428	7/12/04	Alterra Part EP1S25B672C6	\$675.00
PRN52089	7/22/04	Misc. electronics for TC Leeds	\$35.88
PRN52236	7/27/04	Misc. electronics for TC Newark	\$235.15
PO558520	7/21/04	53 MHz anti-alias filters Lark	\$150,000.00
PRN52091	7/27/04	Short cables for test filters	\$937.75
PO558667	8/3/04	Measurement Kit for Network Anal.	\$13,661.00
PO558787	7/28/04	Intercable adopters & terminators	\$5,255.75
173545	7/21/04	System cables	\$74,958.00
		Total	\$245,758.53

**Milestones:**

The project had two DOE milestones in July.

July 19, 2004	First modified Echotek boards delivered
July 9, 2004	Hardware design review finished

The hardware design was officially finished on July 19, 2004.

The Echotek boards were not yet delivered at the end of July. They are expected in August.

**Meetings held, Reports Given:**

Meetings were held in July on the following dates:

Project Meetings: July 7, 14, 15, 19, 21, 22, 26, 28, 29

## **Documents:**

The following documents were written and added to the Accelerator Division Document Database in July:

[Beams-doc-1276-v0 Tevatron BPM Front End Software User's Guide Margaret E Votava et. al.](#) 29 Jul 2004

[Beams-doc-1205-v1 Tevatron BPM Upgrade Calibration Specifications: Part II Robert K Kutschke](#) 26 Jul 2004

[Beams-doc-1067-v17 Tevatron BPM Software Design Luciano Piccoli et. al.](#) 23 Jul 2004

[Beams-doc-1257-v2 BPM upgrade Cable Specification Vince Pavlicek et. al.](#) 22 Jul 2004

[Beams-doc-1265-v1 BPM Timing Generator Fanout Bill of Materials Bill Haynes](#) 22 Jul 2004

[Beams-doc-1261-v1 BPM Timing Generator Fanout Layout Bill Haynes](#) 22 Jul 2004

[Beams-doc-1260-v1 BPM Timing Generator Fanout Schematics Bill Haynes](#) 22 Jul 2004

[Beams-doc-1065-v7 Tev BPM VME Hardware Specifications Vince Pavlicek et. al.](#) 20 Jul 2004

[Beams-doc-1264-v1 BPM Filter Board Bill of Materials Vince Pavlicek](#) 20 Jul 2004

[Beams-doc-1259-v1 Tevatron Filter Board Layout Vince Pavlicek](#) 20 Jul 2004

[Beams-doc-1244-v2 Tevatron Filter Board Schematics Vince Pavlicek](#) 20 Jul 2004

[Beams-doc-1258-v1 Integration Tasks Jim Steimel](#) 18 Jul 2004

[Beams-doc-792-v6 Minutes from the Tevatron BPM Upgrade Project Meetings Steve Wolbers et. al.](#) 09 Jul 2004

[Beams-doc-1245-v1 BPM Consolidated Crate Specification Vince Pavlicek](#) 08 Jul 2004

[Beams-doc-1101-v6 Tevatron Beam Position Monitor Upgrade Offline Software Specification Robert K Kutschke](#) 07 Jul 2004

[Beams-doc-1203-v0 Simulated Tevatron Closed Orbit Position Measurements in Short Gate Mode Robert K Kutschke](#) 07 Jul 2004

## **Subproject Leader Reports:**

### **Technical Coordinator: Jim Steimel**

Service building conditions have been finalized. All rack space scheduled to be cleared is cleared, or will be cleared by the end of the first week of the shutdown.

All service building signal cabling is complete except for F3, F4, 1/2 of F1 and A1. These will be completed during the shutdown.

Project cable labeling scheme is finalized.

A full test stand was constructed in the lab at Feynman including new Echotek modules, filter board, new timing card (not yet fully functional), new processor, and Recycler style timing cards. Beam simulation hardware is also located at the test stand.

All the necessary hardware for constructing and commissioning a prototype system at A3 has been collected and tested at the Feynman test stand.

### **Electronics: Vince Pavlicek**

For July, the electronics group contributed to extensive specification discussions with several possible vendors about our analog filters. Eventually this ended with the selection of a vendor for the analog filters. A possible vendor produced prototype filters and they were extensively tested to ensure their applicability and satisfaction of the requirements.

The prototype filters were also useful for the testing of the analog filter board and showed that the board has very little affect on the BPM signals, as expected. The relay control functions and diagnostic signal paths will be tested next before that board is ready to be released to production. An additional prototype of the filter boards was assembled and signal tested to provide a module for beam tests. Several more will be assembled in the next few weeks.

Echotek module hardware testing continued interleaved with the functional testing on the test stand. Input impedance and return loss were examined across the three boards. Some questions remain about the input transformer and its effect on these two measurements. More effort will be put on this before production is started.

Evaluation of the pilot sub racks was completed and three issues were negotiated with the manufacturer. After this agreement, the production of the remaining sub racks was released. They should begin arriving in early August.

The first timing generator fan-out module was assembled and tested. The RF clock phase lock loop circuitry was tested and the jitter performance was found to be at least equal to the commercial clock generator in the Recycler system. The timing firmware checkout started with the VME bus interface. A second timing board was assembled in order to support the test beam effort.

A specification for all of the cables needed for installation of the systems in the service buildings was begun. This will be followed by a cable requisition. Also a specification for the air dam modules that will fill the unused sub rack slots was started.

### **Front-end/DAQ software: Margaret Votava**

Started integrating the system with mooc alarms, the hooks are in place but the system is not yet generating alarms. Added code for receiving state device changes (e.g. V:CLDRST). Couple of bug fixes detected when running system in test mode. Implementation of a few DataAcquisitionTasks for the tevatron library (closed orbit, turn-by-turn, injection turn-by-turn and closed orbit turn-by-turn). These tasks use a fake data generator that simulates an Echotek set of boards. Completed class for sending closed orbit data to the online software, added fast time plot variables (Z:HPTS0, Z:HPTS1, etc) that enable online plotting of proton/pbar position and intensities (up to 15 Hz). Started integration of the system with the drivers, EchotekPool and TimingSystem classes created by Dehong. We were able to run the system in closed orbit mode, using 64 samples per turn, acquiring data, calculating position and intensities and sending it to the online software using the closed orbit structures and fast time plot devices at 15Hz.

### **Online software: Brian Hendricks**

During the past month, support was added to the BPM library to support the test stand system. The BPM display application was also modified to support this system. Bob West began actual work on the diagnostics application in support of both the test stand and the Tevatron systems. ACNET device structures for diagnostic data were also designed.

### **Offline software: Rob Kutschke**

This month work proceeded at a low level of effort because of other commitments. The main work was document 1205 which outlines the initial calibration which can be applied to the test board in the A3 house during the testing period before the fall shutdown.